Ceramic honeycomb filter for purifying exhaust gases

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Cited Documents: US4390355; EP0205755; US4404007; JP62020613; JP56148607

Abstract

A ceramic honeycomb filter for purifying exhaust gases from combustion engines including a ceramic honeycomb structure formed by extruding and having a number of through-passages (4) alternately closed at their ends by ceramic closure members (2). The through-passages are formed by partition walls (1) for capturing fine particles in the exhaust gases which particles accumulate on the partition walls (1). To avoid damage to the filter by overheating when the accumulated particles are burned out in order to regenerate the filter, porous ceramic layers (3) are provided on the partition walls (1) over a distance of 1/10-8/10 of an effective length of the filter from outlet ends of the through-passages (4).

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㊸公開　昭和63年(1988) 8月1日

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F 01 N 3/02	311	C－7910－3G

審査請求　未請求　発明の数　1　（全5頁）

㊹発明の名称　排ガス浄化用セラミックハニカムフィルタ

㉑特　願　昭62－16124
㉒出　願　昭62(1987) 1月28日

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明　細　書

1.発明の名称　排ガス浄化用セラミックハニカムフィルタ

2.特許請求の範囲

1.　押出し成形によって得られた多数の貫通孔を有するセラミックハニカム構造体の開孔端部が交互にセラミック材で閉塞され、該貫通孔を形成する隔壁により排ガス中の微粒子が捕捉され排ガス入口側の隔壁面上に微粒子が蓄積される排ガス浄化用セラミックハニカムフィルタにおいて、排ガス出口側端部からフィルタ有効全長の1/10～8/10の長さを有する多孔質セラミック層を隔壁面上に設けることを特徴とする排ガス浄化用セラミックハニカムフィルタ。

2.　前記セラミックハニカム構造体がコージェライトである特許請求の範囲第1項記載のフィルタ。

3.　前記多孔質セラミック層がコージェライトである特許請求の範囲第2項記載のフィルタ。

4.　前記多孔質セラミック層が触媒担持層である特許請求の範囲第2項記載のフィルタ。

5.　前記触媒担持層がγアルミナを主成分とする特許請求の範囲第4項記載のフィルタ。

6.　前記多孔質セラミック層が排ガス出口側の隔壁面上に設けられている特許請求の範囲第3項または第4項記載のフィルタ。

3.発明の詳細な説明

（産業上の利用分野）

本発明は、ディーゼルエンジン等の燃焼機関から排出される排ガス中の炭素を主成分とする微粒子を捕捉し、その微粒子を燃焼させて排ガスを浄化するフィルタに関するものである。

（従来の技術）

ディーゼルエンジン等の燃焼機関から排出される排ガス中の炭素を主成分とする微粒子を浄化するフィルタとしては、セラミックハニカムの貫通孔を交互に閉塞したフィルタが例えば特開昭56－124417号公報において知られている。

このようなフィルタは、微粒子が隔壁に堆積さ

れ圧力損失が大きくなりエンジン性能が低下するため、堆積した微粒子を燃焼させてフィルタを再生させる必要があった。

（発明が解決しようとする問題点）

ところで、従来のハニカム構造体においては、フィルタの作用をする隔壁は押出し成形によって製作されているためその壁厚、気孔径、気孔率は実質的にほぼ一様であり、微粒子は隔壁の排ガス入口側から出口側に向けて一様ないしフィルタの出口端では増加して堆積される。

燃焼再生の際には入口側から出口側へ微粒子層が順次着火してフィルタの再生が行なわれるのであるが、上述したように微粒子が堆積した従来のセラミックハニカムフィルタでは、入口側で発生した燃焼熱が出口側へ伝播する一方出口側の微粒子層の燃焼熱のため、出口側隔壁の温度が急上昇してセラミックフィルタが溶融したりまた熱衝撃によりクラックが発生してしまう欠点があった。

この欠点を解消するため、多孔質セラミックハニカム構造体をコルゲート法により排ガス入口側から出口側に向けて気孔率が減少するよう構成することが特開昭61−129017号公報において開示されている。しかしながら、この構造のフィルタを製造するためには、気孔率が異なるセラミックグリーンシートを準備する必要があり、かつ気孔率が異なるグリーンシートの成形体を焼成すると気孔率に応じてグリーンシートの焼成収縮率が異なるため、ハニカム構造体の製造が困難となる欠点があった。

さらに、気孔率はセラミックグリーンシートにより特定されるため、種々の気孔率を有するフィルタを製造する場合、それぞれセラミックグリーンシートを準備する必要があった。

本発明の目的は上述した不具合を解消して、製造が容易で再生燃焼時に溶損や破損の生じないセラミックハニカムフィルタを提供しようとするものである。

（問題点を解決するための手段）

本発明の排ガス浄化用セラミックハニカムフィルタは、押出し成形によって得られた多数の貫通孔を有するセラミックハニカム構造体の開孔端部が交互にセラミック材で閉塞され、該貫通孔を形成する隔壁により排ガス中の微粒子が捕獲され排ガス入口側の隔壁面上に微粒子が蓄積される排ガス浄化用セラミックハニカムフィルタにおいて、排ガス出口側端部からフィルタ有効全長の1/10〜8/10の長さを有する多孔質セラミック層を隔壁面上に設けることを特徴とするものである。

（作　用）

上述した構成において、多孔質セラミック層を設けた部分は隔壁が厚くなり隔壁を通過する排ガス流が制限されるため、その部分に堆積する微粒子の量すなわちスート量が減少して堆積スートの再生燃焼時に発生する熱量が減少するため出口側の温度が低くなるとともに、多孔質セラミック層の熱容量によりスートの燃焼熱が吸収されて隔壁の温度がより低くなるため、フィルタの溶融、破損を生ずることがない。

また、押出し成形によって得られるセラミックハニカム構造体の隔壁上に単に多孔質セラミック層を被覆するのみで種々の気孔率を有するフィルタが得られるので、製造は簡単となる。

さらに、多孔質セラミック層をγ−アルミナ等の触媒担体用補助材で形成して白金等の触媒を担持すると、微粒子の除去とともに排ガス中に存在する一酸化炭素、炭化水素類、窒素酸化物を分解することが可能となる。

なお、本発明で多孔質セラミック層を設けた排ガス出口側端部からフィルタ有効全長の1/10〜8/10の部分は、多孔質セラミック層を設けないで堆積した微粒子が燃焼する際に発熱温度が約 700℃以上となる隔壁の部分に対応しており、セラミックハニカムフィルタの径、長さ、セル密度等により最適な値が定まるものであるが、上述した範囲の長さの多孔質セラミック層であればその効果がある。

（実施例）

第1図は本発明の排ガス浄化用セラミックハニカムフィルタの一実施例を説明するための断面図である。第1図において、1はセラミックハニカ

ム構造体の隔壁、2は貫通孔4の閉塞部、3は多孔質セラミック層、4は隔壁1により画成される貫通孔であり、5及び矢印は排ガスの流れを示す。多孔質セラミック層3がフィルタ有効全長の 1/2 の排ガス出口側の隔壁面上に設けた場合を示している。なお、本発明で多孔質セラミック層3の有効長さは閉塞部2を除く隔壁1の有効フィルタ長さを意味するものとする。

セラミックハニカム構造体としては、均一な形状、気孔径、気孔率、生産性の面から押し出し成形により製造したものが好適に使用でき、その材質は熱衝撃性、気孔率の面からコージェライトを使用すると好適である。また、貫通孔4の形状としては断面が六角形、四角形、丸形等で、その数はセル密度 7.7～46.5セル／cm²(50～300CPI²)のものが好適である。さらに、隔壁1の厚みは0.25～0.76mm (10～30mil)が好適である。

閉塞部2はハニカム構造体の成形体および焼成体の所定の貫通孔を閉塞することにより作製し、その材質はセラミックハニカム構造体の材質と同一の材質であると好ましい。

多孔質セラミック層3は排ガス出口側の端部から上述した所定の長さにわたって排ガスの入口側および出口側の隔壁1上の両方あるいはいずれか一方に設けられる。また、多孔質セラミック層3に触媒担持補助材を兼ねさせることも可能で、その場合この触媒担持補助材をγ－アルミナ等で形成して白金等の触媒を担持させて触媒担持層を形成することにより、微粒子を含む排ガスの浄化とともに排ガス中に含まれる一酸化炭素、炭化水素類、窒素酸化物を酸化還元したり、またスートの着火温度を低くして連続的に体積スートを燃焼させることが可能となる。

多孔質セラミック層3の材質としては、耐熱性および所定の気孔率の面からセラミック材が選ばれ、隔壁と同じ材質の場合熱膨脹係数が一致するため特に好ましい。

多孔質セラミック層3の厚みは、隔壁1の厚さ、気孔率、多孔質セラミック層3の材質および気孔率によって選択され、排ガス入口側から出口側に均一な厚さ、あるいは徐々に厚くしてもよいが、微粒子の燃焼熱による隔壁の温度上昇を抑制するためには比較的厚く形成してもよい。例えば、直径143.8mm(5.66インチ)、長さ152.4mm(6インチ)、気孔率50％、セル密度31セル／cm²(200CPI²)、隔壁の厚さ 0.3 mm(12mil)のコージェライトハニカムの場合には、重さに換算して全体で400gの多孔質セラミック層3を排ガスの排出側にフィルタ有効全長8/10の有効長さにわたって設けても効果がある。

実施例

第1表に示す二種類の形状のコージェライトからなるハニカム構造体を準備し、第1表に示す材質、長さ、重量の多孔質セラミック層を設けた本発明品試料No.1～10、参考例No.11～13および多孔質セラミック層を設けない従来品試料No.14, 15のセラミックハニカムフィルタを得た。得られたフィルタをディーゼルエンジンに装着して、第1表に示す量の炭素を主成分とする微粒子（スート）を隔壁に堆積させた。その後、フィルタの排ガス入口側の微粒子にバーナで着火し、各フィルタのフィルタ内最高温度を測定するとともに、スート燃焼後のフィルタ損傷状況を調べた。結果を第1表に、排ガス出口側からの多孔質層の長さ／フィルタ有効全長と、フィルタ内の最高温度との関係を第2図に示す。

第 1 表

試料No		フィルタ				多孔質層				堆積スート量	フィルタ内最高温度	フィルタ損傷状況
		形状(mm)		セル構造		材料	寸法*		重量			
		直径	全長	壁厚(mm)	密度(セル/cm²)		割合	長さ(mm)	(g/cm³)	(g)	(℃)	
本発明	1	143.8	152.4	0.3	31	コージェライト	1/10	13	0.14	20	1040	異状なし
	2	〃	〃	〃	〃	〃	2/10	26	〃	〃	990	〃
	3	〃	〃	〃	〃	〃	4/10	52	〃	〃	860	〃
	4	〃	〃	〃	〃	〃	6/10	79	〃	〃	840	〃
	5	〃	〃	〃	〃	〃	8/10	106	〃	〃	1000	〃
	6	〃	355.6	0.4	15	〃	1/10	34	〃	〃	1010	異常なし
	7	〃	〃	〃	〃	〃	2/10	67	〃	〃	860	〃
	8	〃	〃	〃	〃	〃	6/10	201	〃	〃	680	〃
	9	〃	〃	〃	〃	〃	8/10	268	〃	〃	990	〃
	10	〃	152.4	0.3	31	γ−アルミナ	6/10	79	〃	〃	850	〃
参考例	11	〃	〃	〃	〃	コージェライト	0.5/10	7	〃	〃	1160	破損
	12	〃	〃	〃	〃	〃	9/10	119	〃	〃	1110	〃
	13	〃	〃	〃	〃	〃	10/10	132	〃	〃	1140	〃
実施例	14	〃	〃	〃	〃	コージェライト	0	0	0	〃	1400	溶損
	15	〃	355.6	0.4	15	〃	0	0	0	〃	1240	破損

* 多孔質層寸法は目封じ部を除いて表した。

第1表及び第2図から明らかなように、多孔質セラミック層の有効長さが1/10〜8/10である試料No.1〜10のフィルタ内最高温度は、多孔質セラミック層を設けなかった試料No.14および15と比較して低くなり、破損、溶損が生じないことがわかった。また、全体に多孔質セラミック層を設けた試料No.13では微粒子がフィルタ内に均一に堆積してしまい、多孔質セラミック層を設けない試料No.14よりフィルタ内最高温度は低くなるものの破損してしまうことがわかった。また、多孔質セラミック層をγ−アルミナで形成して触媒担持補助材の役目を兼ねさせた試料No.10でもフィルタ内最高温度は低くなり、破損の危険もなくなることがわかった。

(発明の効果)

以上詳細に説明したところから明らかなように、本発明の排ガス浄化用セラミックハニカムフィルタによれば、排ガス出口側端部から所定有効長さの多孔質セラミック層を隔壁面上に設けることにより、フィルタ再生化のための堆積した微粒子の燃焼時に溶損や破損の生じないセラミックハニカムフィルタを簡単に得ることができる。

4. 図面の簡単な説明

第1図は本発明の排ガス浄化用セラミックハニカムフィルタの一実施例を説明するための断面図、

第2図は多孔質セラミック層の長さとフィルタ内最高温度との関係を示すグラフである。

1…隔壁　　2…閉塞部

3…多孔質セラミック層

4…貫通孔　　5…排ガスの流れ

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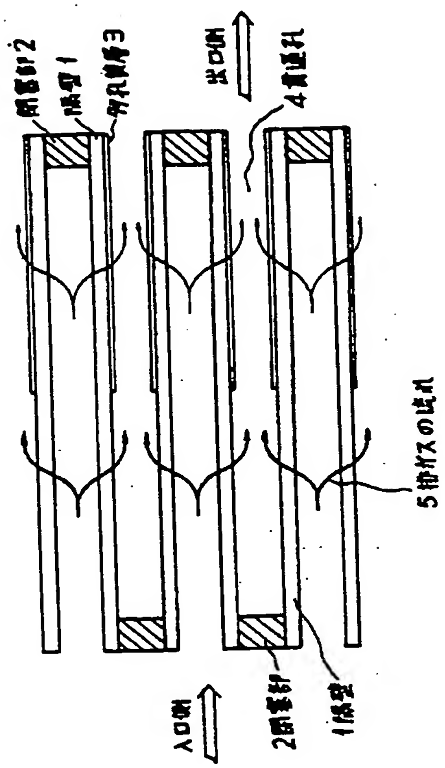
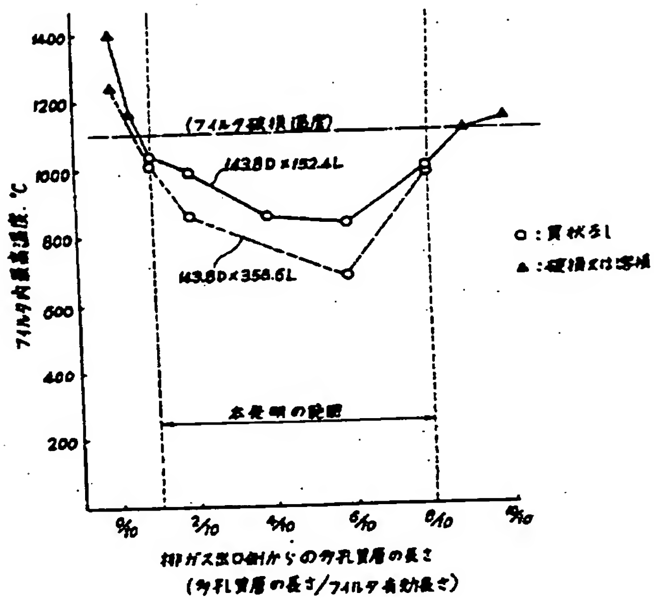
代理人弁理士　杉村暁秀

同　弁理士　杉村興作

第1図


閉塞部2
隔壁1
多孔質層3
出口側
4貫通孔
5排ガスの流れ
入口側
2閉塞部
1隔壁

第 2 図


1400
1200
1000
800
600
400
200
(フィルタ破損温度)
143.8D×152.4L
143.8D×358.6L
本発明の範囲
フィルタ内最高温度, ℃
0/10
2/10
4/10
6/10
8/10
10/10
排ガス出口側からの多孔質層の長さ
(多孔質層の長さ/フィルタ有効長さ)
○:異状なし
▲:破損又は溶損

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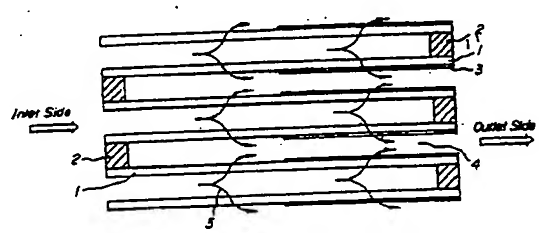
(54) **Ceramic honeycomb filter for purifying exhaust gases.**

(57) A ceramic honeycomb filter for purifying exhaust gases from combustion engines including a ceramic honeycomb structure formed by extruding and having a number of through-passages (4) alternately closed at their ends by ceramic closure members (2). The through-passages are formed by partition walls (1) for capturing fine particles in the exhaust gases which particles accumulate on the partition walls (1). To avoid damage to the filter by overheating when the accumulated particles are burned out in order to regenerate the filter, porous ceramic layers (3) are provided on the partition walls (1) over a distance of 1/10-8/10 of an effective length of the filter from outlet ends of the through-passages (4).

FIG_1



EP 0 277 012 A1

Description

CERAMIC HONEYCOMB FILTER FOR PURIFYING EXHAUST GASES

This invention relates to a filter for capturing fine particles mainly consisting of carbon in exhaust gases exhausted from combustion engines such as diesel engines and burning the particles to purify the exhaust gases.

A filter for purifying exhaust gases from combustion engines such as diesel engines by removing fine particles mainly consisting of carbon included in the exhaust gases has been known as disclosed for example, United States Patent specification No. 4,364,761 comprising a ceramic honeycomb structure having alternately closed through-apertures. In such a filter, as the fine particles are accumulated in partition walls of the honeycomb structure, pressure losses become large to lower engine performance. Therefore, it is necessary to burn the accumulated fine particles so as to recover the filtering performance.

In conventional honeycomb structures, the partition walls thereof for filtering are usually formed by extruding so that thicknesses of the walls, diameters of pores and porosity of the walls are substantially uniform throughout the structure. The fine particles are therefore accumulated uniformly from inlets to outlets of the partition walls of the honeycomb structures or increasing at the outlet ends.

When the particles are burned to recover the filter, the fine particle layers are progressively burned from the inlet side to the outlet side to restore the filter. In the conventional honeycomb filters adapted to accumulate fine particles thereon, burning heat produced on the inlet side transmits to the outlet side, and further temperature of partition walls on the outlet side rapidly rises owing to burning heat of the fine particles on the outlet sides so that the ceramic filter may melt or cracks may occur due to thermal shock in such a rapid temperature rise.

In order to eliminate such a disadvantage, porous ceramic honeycomb structures are so formed by a corrugate method that the porosity of partition walls decreases from the inlet side to the outlet side as disclosed in Japanese Patent Application Laid-open No.61-129,017. In order to produce such filters having the uneven porosity, however, ceramic green sheets having different porosities must be prepared. What is worse still, such ceramic green sheets of the different porosities make difficult the production of honeycomb structures due to different contraction rates dependent upon their porosities when formed green sheets are fired.

In order to produce filters having various porosities, moreover, various ceramic green sheets must be prepared because the porosities are determined by ceramic green sheets.

It is a primary object of the invention to provide a ceramic honeycomb filter which at least partly eliminates the above described disadvantages of the prior art and which may be easily manufactured and can be recovered by burning without any melting and damage of the filter.

According to the invention, in a ceramic honeycomb filter for purifying exhaust gases, said filter including a ceramic honeycomb structure formed by extruding and having a number of through-passages alternately closed at their ends by ceramic closure members, said through-passages being formed by partition walls for capturing fine particles in the exhaust gases accumulated on the partition walls, the ceramic honeycomb filter comprises porous ceramic layers provided on the partition walls over a distance of 1/10-8/10 of an effective length of said filter from outlet ends of said through-passages for the exhaust gases.

With the above arrangement, the portions of the partition walls provided with the porous ceramic layers become thicker to restrict flows of the exhaust gases passing therethrough so that amounts of fine particles or soot to accumulate thereon will decrease. As a result, when burning the accumulated soot for recovering the filter, heat produced in the partition walls will decrease so that the temperature of the partition walls on the side of the outlet ends becomes lower in conjunction with absorption of the heat in burning the soot by a heat capacity of the porous ceramic layers, thereby preventing any melt and damage of the filter.

Moreover, filters having various porosities can be manufactured simply by coating the porous ceramic layers on the partition walls of the ceramic honeycomb structure formed by extruding according to the invention.

If the porous ceramic layers are made as a catalyst auxiliary carrier of γ-alumina to carry a catalyst such as platinum, carbon monoxide, hydrocarbon and nitrogen oxide in the exhaust gases can be decomposed in addition to the removal of the fine particles in the exhaust gases.

The portions of partition walls provided with the porous ceramic layers over the distance of 1/10-8/10 of the effective length of the filter from the outlet ends of the through-passages corresponds to zones of the partition walls whose temperature heated by the heat produced in burning the accumulated fine particles becomes approximately more than 700°C when the filter is not provided with porous ceramic layers. Therefore, the length of the porous ceramic layers should be determined dependently upon a diameter and a length of the ceramic honeycomb filter and a cell density. However, the porous ceramic layers having a length within the range above described bring about the effects of the invention.

In order that the invention may be more clearly understood, preferred embodiments will be described, by way of example, with reference to the accompanying drawings.

Fig. 1 is a sectional view for explaining one embodiment of the ceramic honeycomb filter for purifying exhaust gases according to the invention; and

Fig. 2 is a graph illustrating relations between lengths of porous ceramic layers and maximum temperatures in filters.

Fig. 1 is a sectional view for explaining one embodiment of the ceramic honeycomb structure for purifying exhaust gases according to the invention. The ceramic honeycomb structure shown in Fig. 1 comprises partition walls 1 forming through-passages 4, closure members 2 for closing ends of the through-passages 4, and porous ceramic layers 3. Arrows 5 denote flows of exhaust gases. In this embodiment, the porous ceramic layers 3 are provided on the partition walls over one half of filter effective lengths on the side of outlets of the exhaust gases. A term of "effective length of the ceramic honeycomb filter" used herein is intended to mean the effective filter length of the partition walls 1 except the closure members 2.

As the ceramic honeycomb constructions used herein, those formed by extruding are preferably used in view of their uniform shapes, diameters of pores, porosities and productivity. Cordierite is preferable as a material of the ceramic honeycomb structure in view of thermal shock-resistance and porosity. Moreover, the through-apertures 4 are preferably hexagonal, square, circular or the like in section. The numbers of the through-apertures are preferably those within a range of 7.7-46.5 cells/cm^2 (50-300 CPI^2) in cell density. Further, thicknesses of the partition walls are preferably 0.25-0.76 mm (10-30 mil).

The closure members 2 are formed by closing predetermined ends of the through-passages of the formed and fired honeycomb structure. The material of the closure members are preferably the same as that of the ceramic honeycomb structure.

The porous ceramic layers 3 are provided on the partition walls 1 on either or both the inlet and outlet sides over the predetermined length above described from the ends on the outlet side. The porous ceramic layers 3 may also be used as catalyst auxiliary carriers. In this case, the catalyst auxiliary carriers are made of γ-alumina or the like to carry a catalyst such as platinum so as to form catalyst carrier layers. With this arrangement, the exhaust gases including fine particles can be purified, while carbon monoxide, hydrocarbon and nitrogen oxide can be oxidized or reduced. Moreover, accumulated soot can be continuously burned by lowering catch fire point of the soot.

The material of the porous ceramic layers 3 is preferably a ceramic material in view of heat-resistance and a predetermined porosity and more preferably the same material as the partition walls because of no difference in heat expansion coefficient.

The thickness of the porous ceramic layers 3 can be selected dependently upon the thickness and porosity of the partition walls and the material and porosity of the porous ceramic layers 3. The thickness of the porous ceramic layers 3 may be uniform or progressively increased from the inlet side to the outlet side for exhaust gases. However, the porous ceramic layers 3 may be comparatively thick in order to prevent the temperature rise of the partition walls due to the burning heat of the fine particles. For example, with honeycomb structure made of cordierite having 143.8 mm (5.66 inch) diameter, 152.4 mm (6 inch) length, 50% porosity, 31 cells/cm^2 (200 CPI^2) cell density and 0.3 mm (12 mil) partition wall thickness, porous ceramic layers 3 of 400 g is provided on the outlet side over 8/10 of filter effective length to obtain the required effect.

Example

Honeycomb structures made of cordierite of shapes of two kinds as shown in Table 1 were prepared to produce samples Nos. 1-10 and reference examples Nos. 11-13 having porous ceramic layers of the material, lengths and weights as shown in Table 1, and prior art examples Nos. 14 and 15 having no porous ceramic layers. The obtained filters were provided on a diesel engine. Fine particles (soot) mainly consisting of carbon were accumulated on partition walls of the samples, accumulated amounts being shown in Table 1. Thereafter, fine particles on inlet sides of the exhaust gases were burned by a burner to measure the maximum temperatures in the respective filters and to inspect damaged conditions of the filters after burning the soot, results of which are shown in Table 1. Fig. 2 illustrates relations between ratios of lengths of the porous layers from outlet ends to filter effective lengths and the maximum temperatures in the filters.

Table 1

Sample No.		Filter: Shape (mm): Diameter	Filter: Shape (mm): Total length	Filter: Cell structure: Thickness of wall (mm)	Filter: Cell structure: Density (cell/cm²)	Porous layer: Material	Porous layer: Dimension *: Ratio to filter effective length	Porous layer: Dimension *: Length (mm)	Porous layer: Weight (g/cm³)	Amount of accumulated soot (g)	Maximum temperature in filter (°C)	Damaged condition of filter
Present invention	1	143.8	152.4	0.3	31	Cordierite	1/10	13	0.14	20	1040	in good order
	2	"	"	"	"	"	2/10	26	"	"	990	"
	3	"	"	"	"	"	4/10	52	"	"	860	"
	4	"	"	"	"	"	6/10	79	"	"	840	"
	5	"	"	"	"	"	8/10	106	"	"	1000	"
	6	"	355.6	0.4	15	"	1/10	34	"	"	1010	in good order
	7	"	"	"	"	"	2/10	67	"	"	860	"
	8	"	"	"	"	"	6/10	201	"	"	680	"
	9	"	"	"	"	"	8/10	268	"	"	990	"
	10	"	152.4	0.3	31	γ-alumina	6/10	79	"	"	850	"
Reference example	11	"	"	"	"	Cordierite	0.5/10	7	"	"	1160	damaged
	12	"	"	"	"	"	9/10	119	"	"	1110	"
	13	"	"	"	"	"	10/10	132	"	"	1140	"
Reference example	14	"	"	"	"	Cordierite	0	0	0	"	1400	melted
	15	"	355.6	0.4	15	"	0	0	0	"	1240	damaged

* The dimensions of porous layers do not include sealed portions.

As can be seen from Table 1 and Fig. 2, the maximum temperatures in the filters Nos. 1-10 provided with the porous ceramic layers having ratios 1/10-8/10 to filter effective lengths are lower than those of the filters

Nos. 14 and 15 having no porous ceramic layers. As a result, the filters Nos. 1-10 do not give rise to any damage and melt. With the filter No. 13 provided with the porous ceramic layer all over the filter, fine particles are uniformly accumulated in the filter so that the filter is likely to be damaged although the maximum temperature in the filter is lower than those in the filter No. 14 having no porous ceramic layer. Moreover, even with the filter No. 10 having the porous ceramic layers of γ-alumina serving also as catalyst auxiliary carriers, the maximum temperature is lower to eliminate the risk of damage.

As can be seen from the above explanation, the ceramic honeycomb filter according to the invention can prevent any damage and melt in burning fine particles accumulated in the filter for recovering the filter by providing porous ceramic layers on partition walls over a predetermined distance from exhaust gas outlet end of the filter.

Claims

1. A ceramic honeycomb filter for purifying exhaust gases, said filter including a ceramic honeycomb structure formed by extruding and having a number of through-passages (4) alternately closed at their ends by ceramic closure members (2), said through-passages being formed by partition walls (1) for capturing fine particles in the exhaust gases, characterized by porous ceramic layers (3) provided on the partition walls over a distance of 1/10-8/10 of an effective length of said filter from the outlet ends of said through-passages for the exhaust gases.

2. A ceramic honeycomb filter according to claim 1, wherein said ceramic honeycomb structure is made of cordierite.

3. A ceramic honeycomb filter according to claim 1 or claim 2, wherein said porous ceramic layers (3) are made of cordierite.

4. A ceramic honeycomb filter according to claim 1 or claim 2 wherein said porous ceramic layers (3) are catalyst carriers for carrying a catalyst.

5. A ceramic honeycomb filter according to claim 4, wherein said catalyst carriers consist at least partly of γ-alumina.

6. A ceramic honeycomb filter according to any one of the preceding claims wherein said porous ceramic layers (3) are provided on surfaces of said partition walls (1) on a side of said outlet ends of said through-passages.

FIG. 1

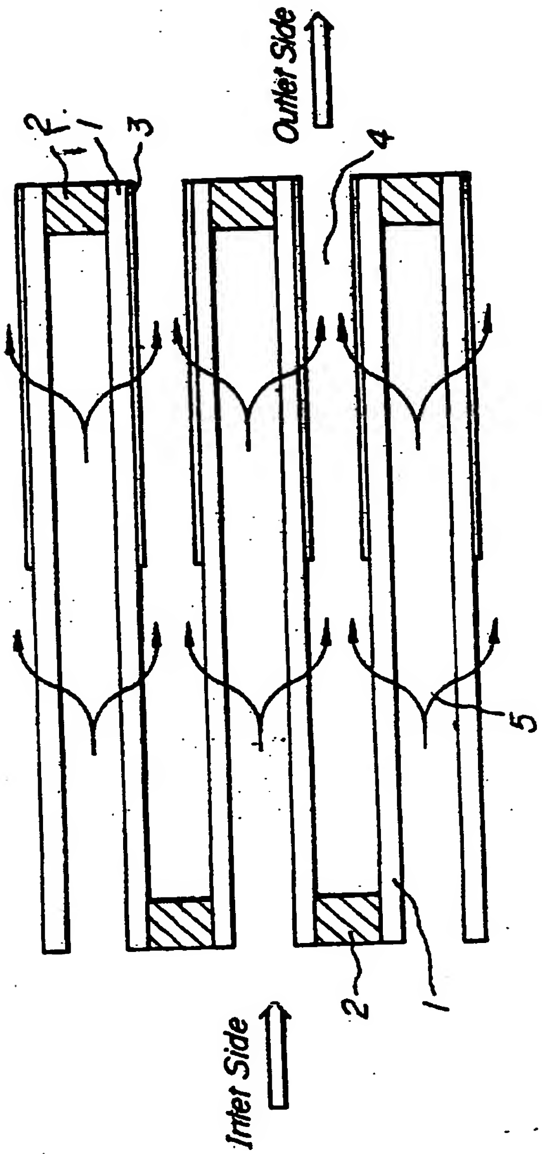


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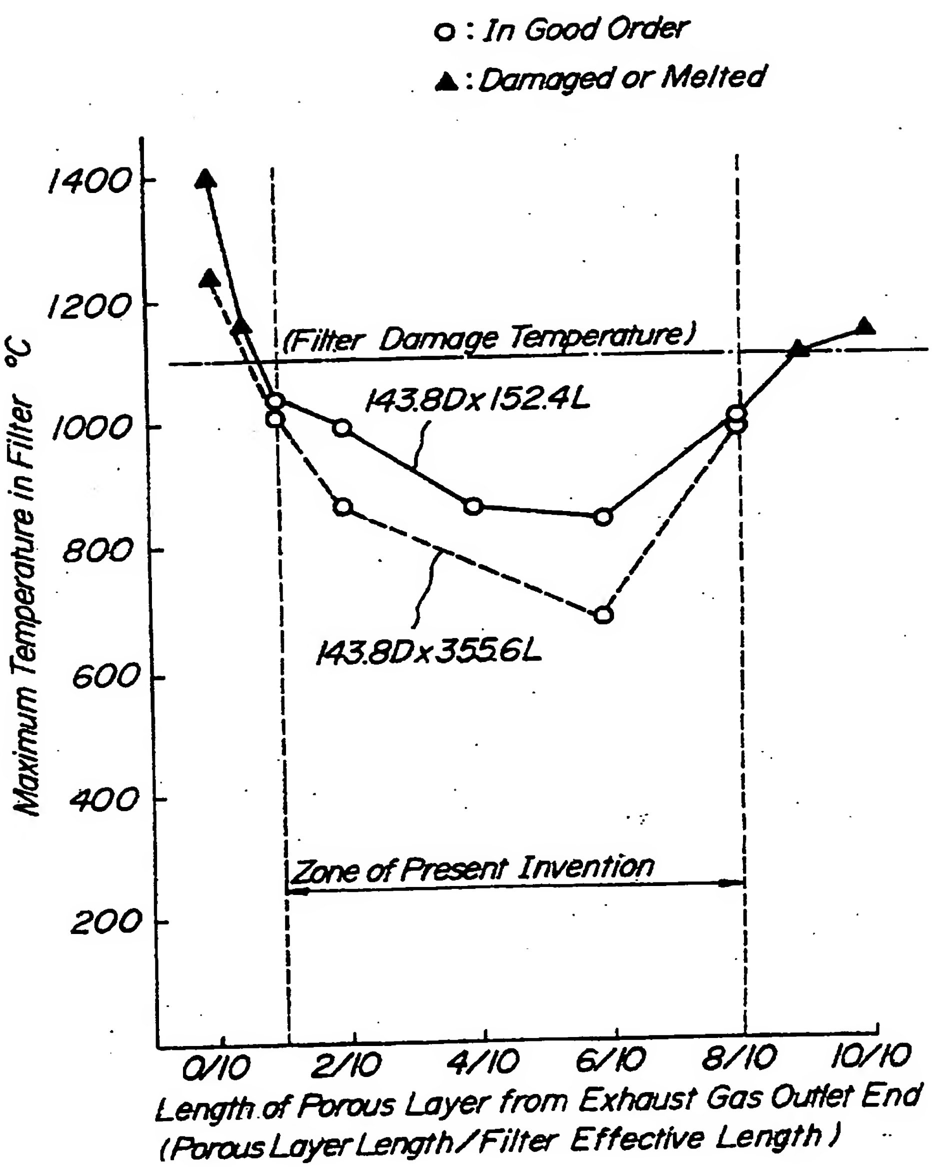
FIG_2



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EUROPEAN SEARCH REPORT

Application Number

EP 88 30 0717

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-4 390 355 (D.C. HAMMOND, Jr.) * Column 2, lines 23-56; column 6, lines 52-58; figure 4; claims 1,2 * ---	1-3	F 01 N 3/02 F 01 N 3/28 B 01 D 46/10
X	EP-A-0 205 755 (MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD) * Page 7, lines 11-17; figures 3a,3b; claims 1,2,5,6 * ---	1	
X	PATENT ABSTRACTS OF JAPAN, vol. 11, no. 196 (M-601)[2643], 24th June 1987; & JP-A-62 20 613 (CATALER KOGYO K.K.) 29-01-1987 * Abstract * ---	1,4,6	
E	PATENT ABSTRACTS OF JAPAN, vol. 6, no. 33 (M-114)[911], 27th February 1982; & JP-A-56 148 607 (ENUKOA K.K.) 18-11-1981 * Abstract * ---	1,4,6	
A	US-A-4 404 007 (TOSHIYUKI TUKAO) -----		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)
B 01 D 46/00 F 01 N 3/00 C 04 B 38/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10-05-1988	POLESAK, H.F.

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